Informal Environment Council meeting, 14-15 April 2009

Overview of climate change impacts, vulnerability and adaptation in Europe

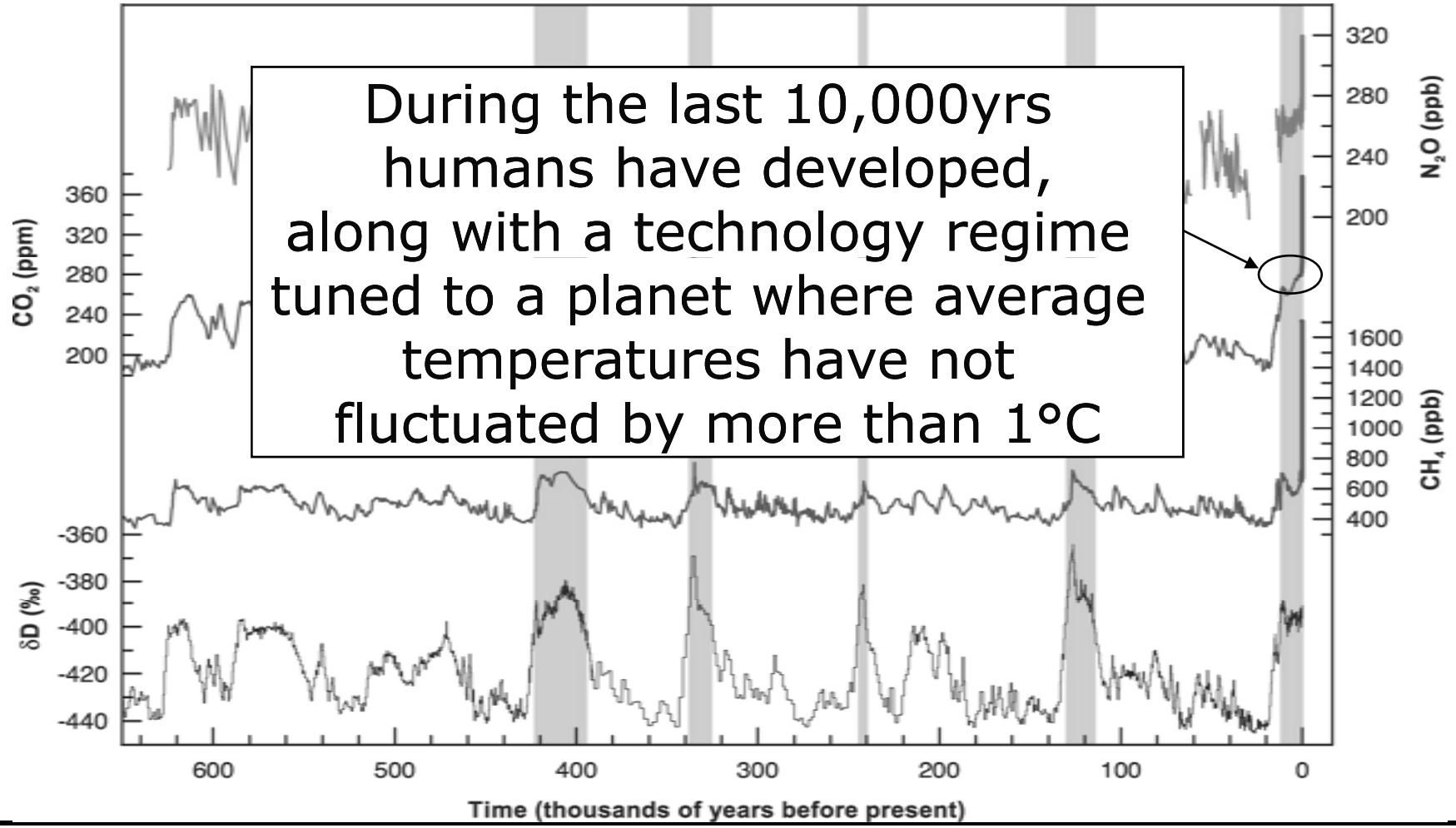
Professor Jacqueline McGlade

Executive Director

European Environment Agency

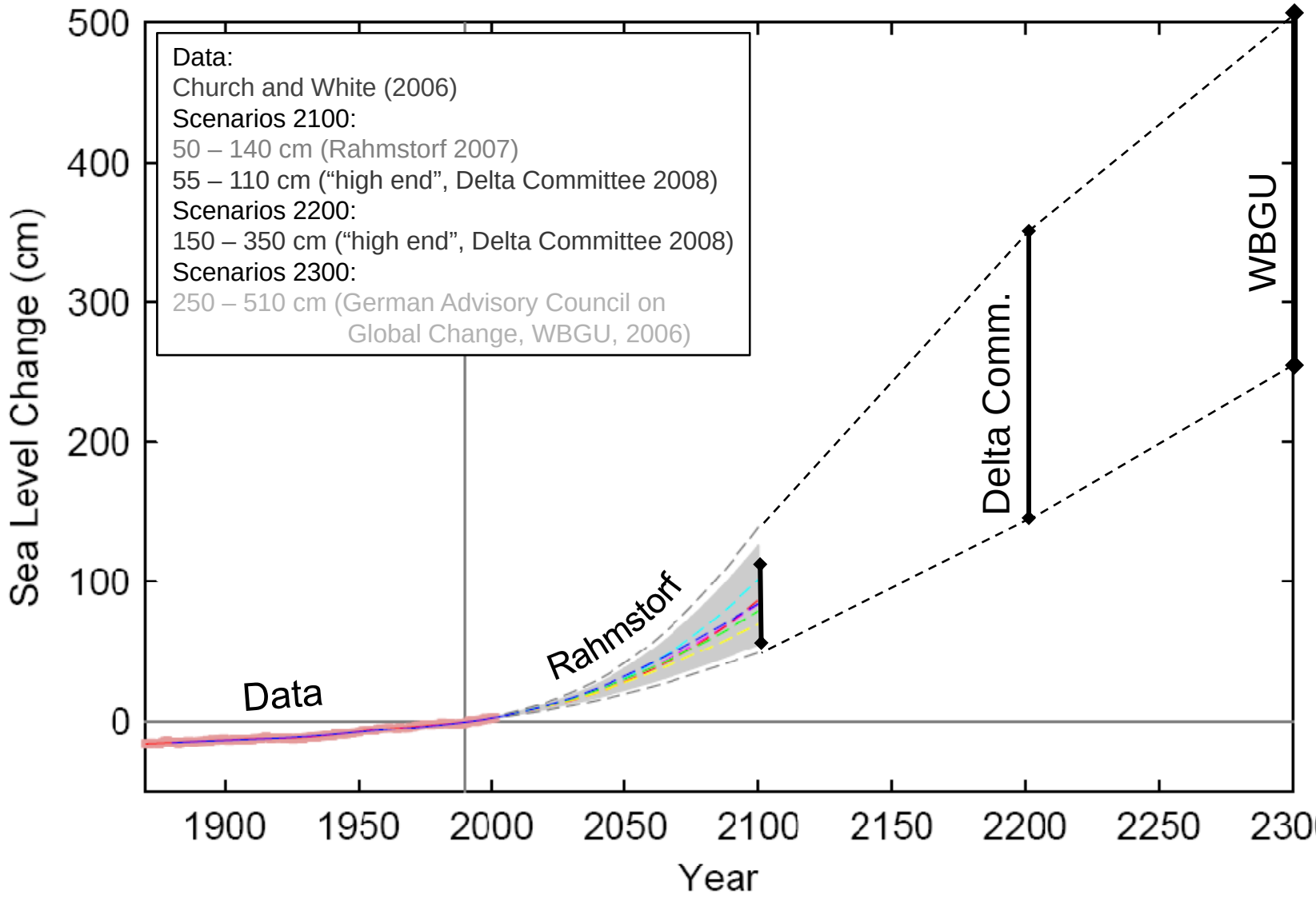
CO_2 concentration over the past 650 000 years

- Due to emissions from human activities the CO2 concentration is 385 ppm (2008), far exceeding the natural range over the last 650 000 years (180 – 300 ppm)

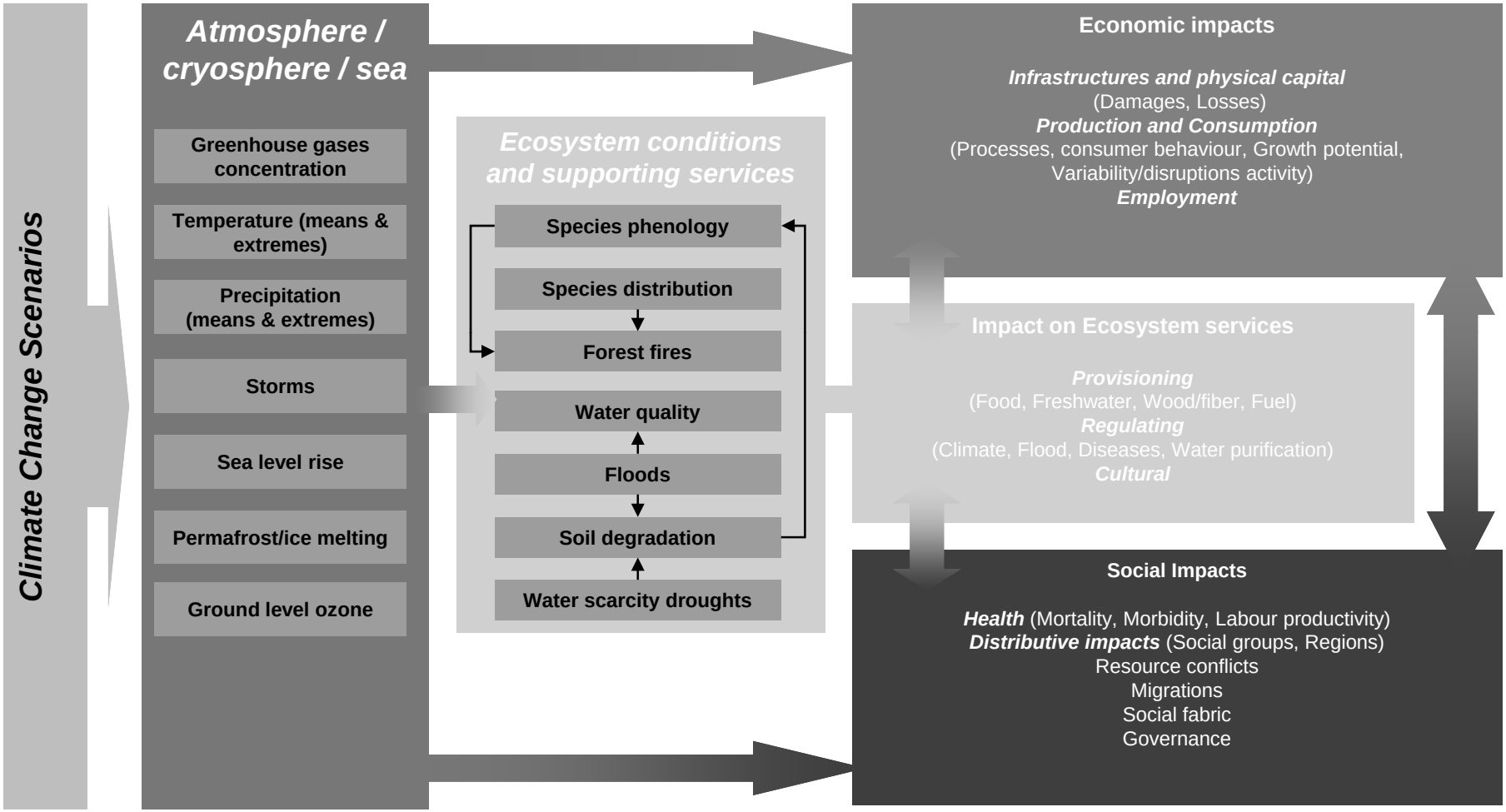


European Environment Agency

Recent Global Sea Level Rise projections (up to 140 cm by 2100) are above the IPCC (2007) upper limit (of 59 cm by 2100)

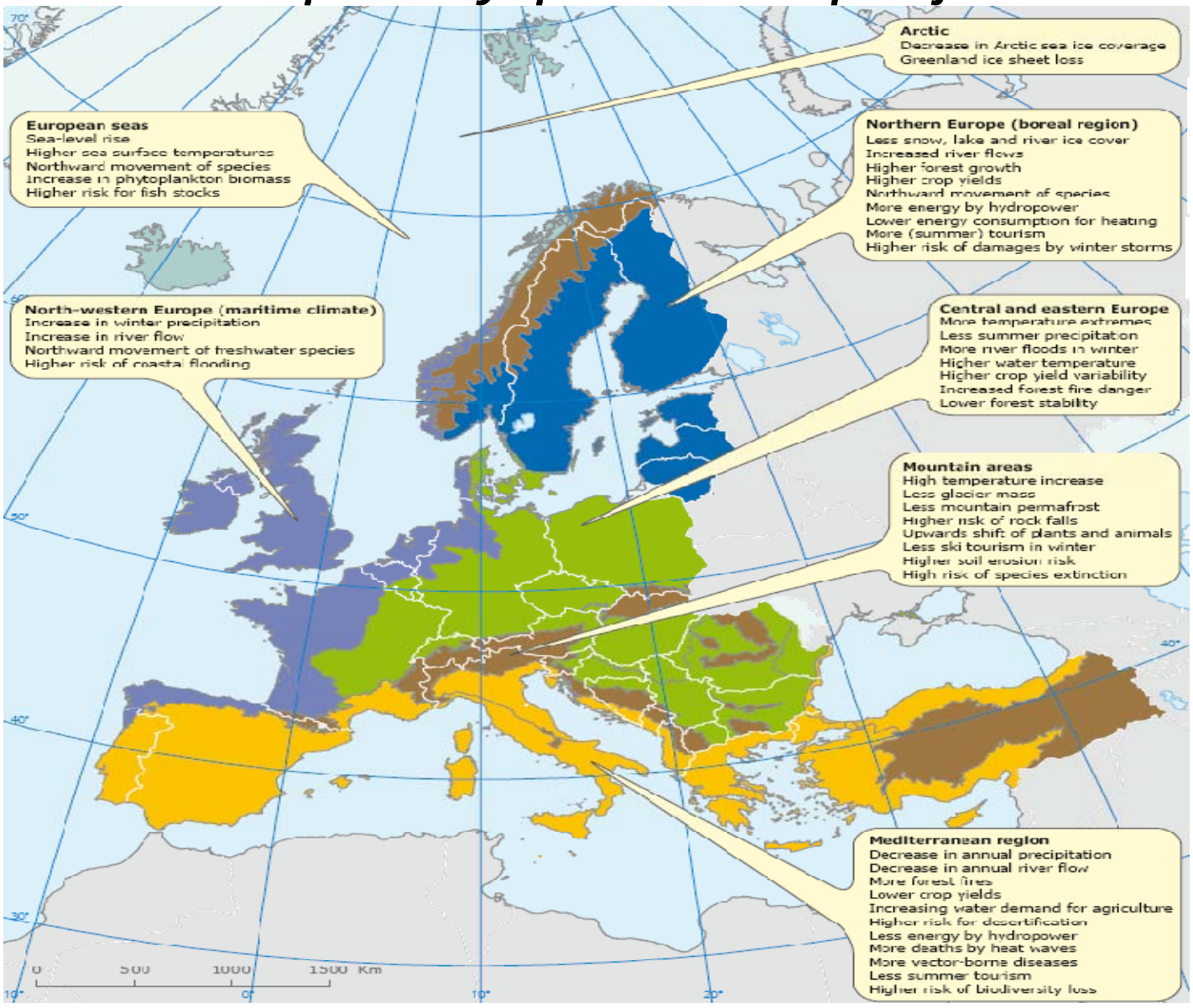


Impacts of Climate Change



Source: Environment DG based on (EEA, 2008) , OECD 2008 and TEEB. **Potential impacts are** all impacts that may occur given a projected change in climate, without considering adaptation.

Europe key past and projected impacts



Arctic

Arctic — Greenland (not EEA member)

Boreal region

North-western Europe

Central and eastern Europe

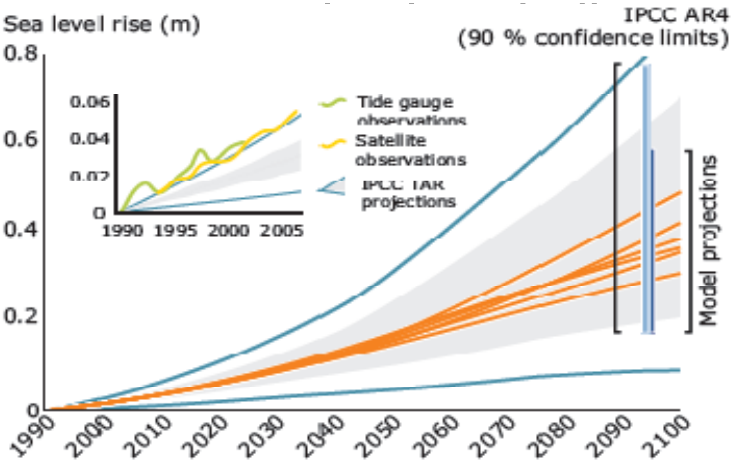
Mountain areas

Mediterranean region

Main biogeographic regions of Europe (EEA member countries)

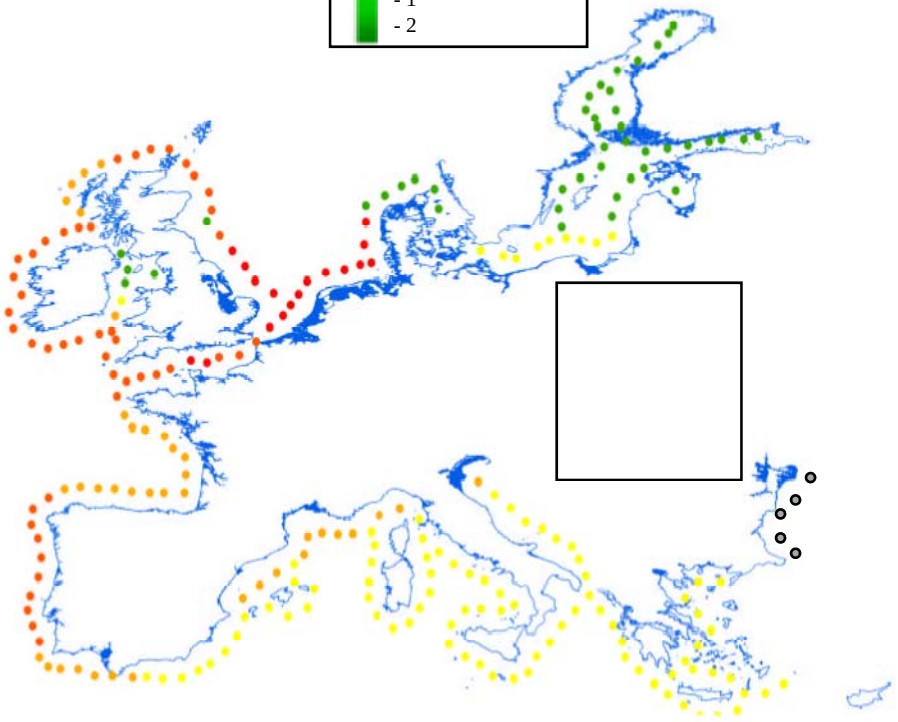
Sea level rise

- Sea level will rise 0.18 to 0.59 m from 1980-2000 to 2100 (IPCC)



Projected global average sea-level rise 1990-2100

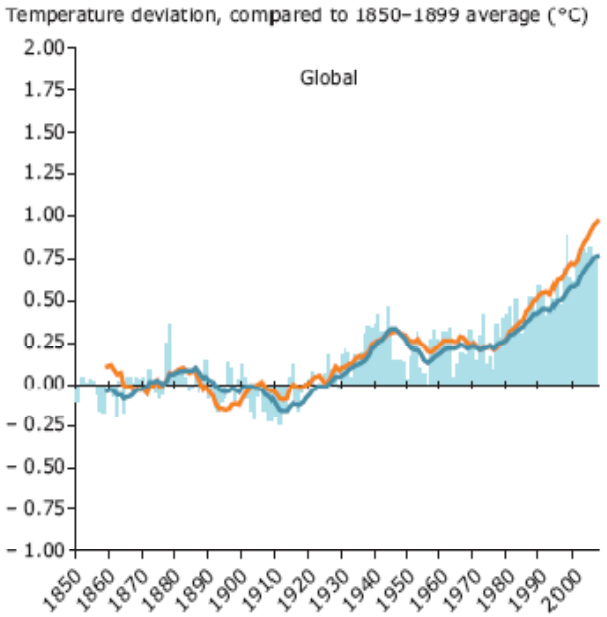
Source: EC, 2009

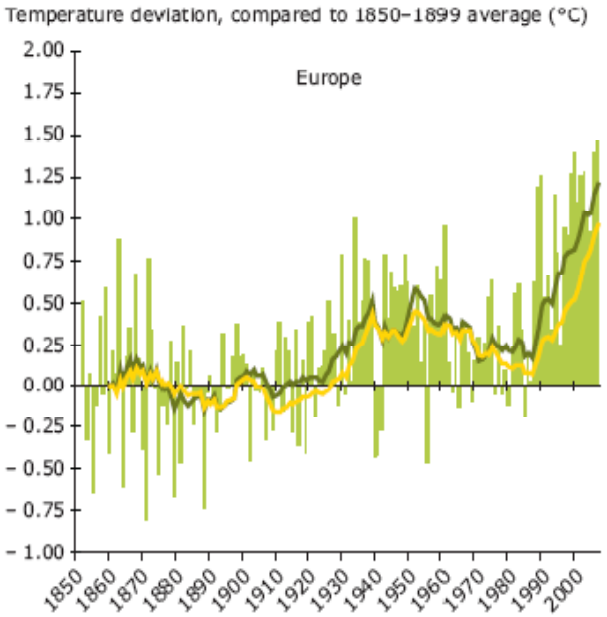


Global and European temperature

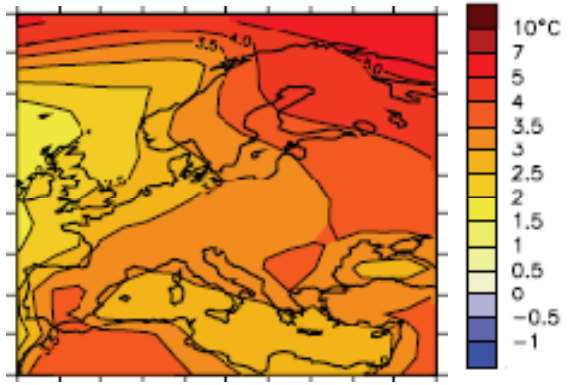
past

- Global temperature (2007) : + 0.8 °C (above 1850-1899 average)
- European temperature (2007) : + 1.0 °C (above 1850-1899 average)





Observed global and European annual average temperature deviations 1850-2007



Modelled change in annual mean temperature over Europe between 1980-1999 and 2080-2099

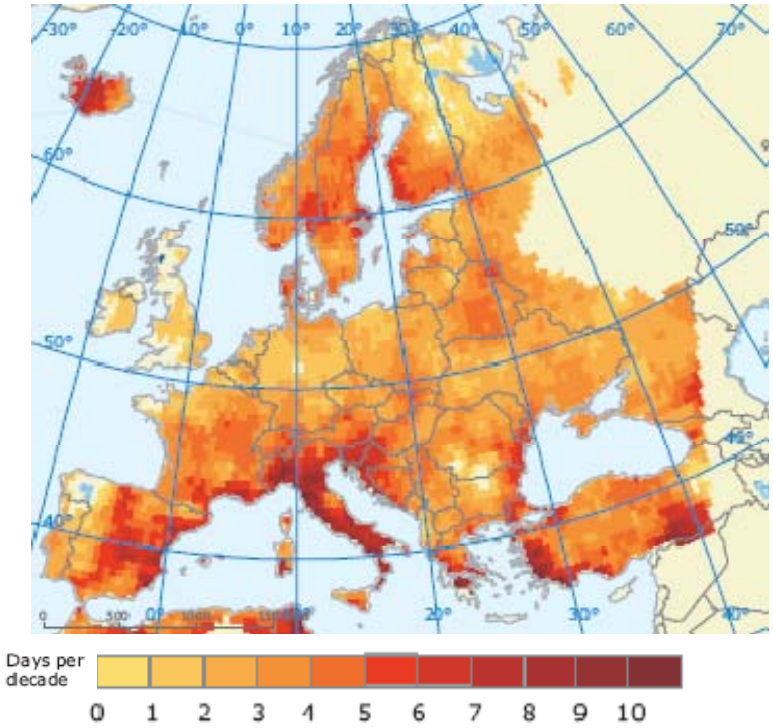
future

- Global projection (1980-1999 to 2080-2100) : + 1.1-6.4 °C
- Europe (1961-1990 to 2080-2100) : + 1.0–5.5 °C

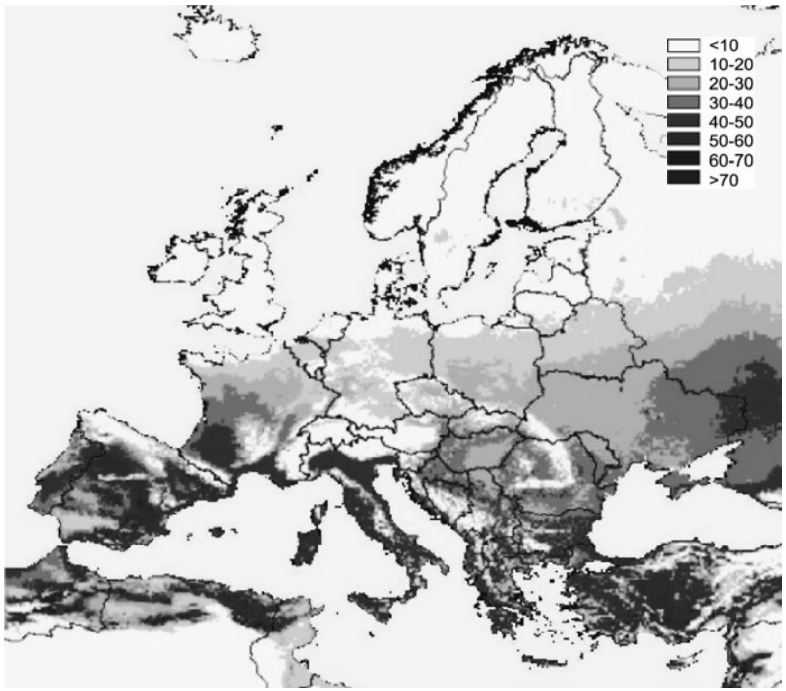
Temperature extremes in Europe

- Extremes of cold became less frequent and warm extremes more frequent
- Number of hot days almost tripled between 1880 and 2005

past



Observed changes in duration of warm spells in summer in the period 1976 - 2006



Projected changes in number of tropical nights between periods 1961-1990 and 2071-2100

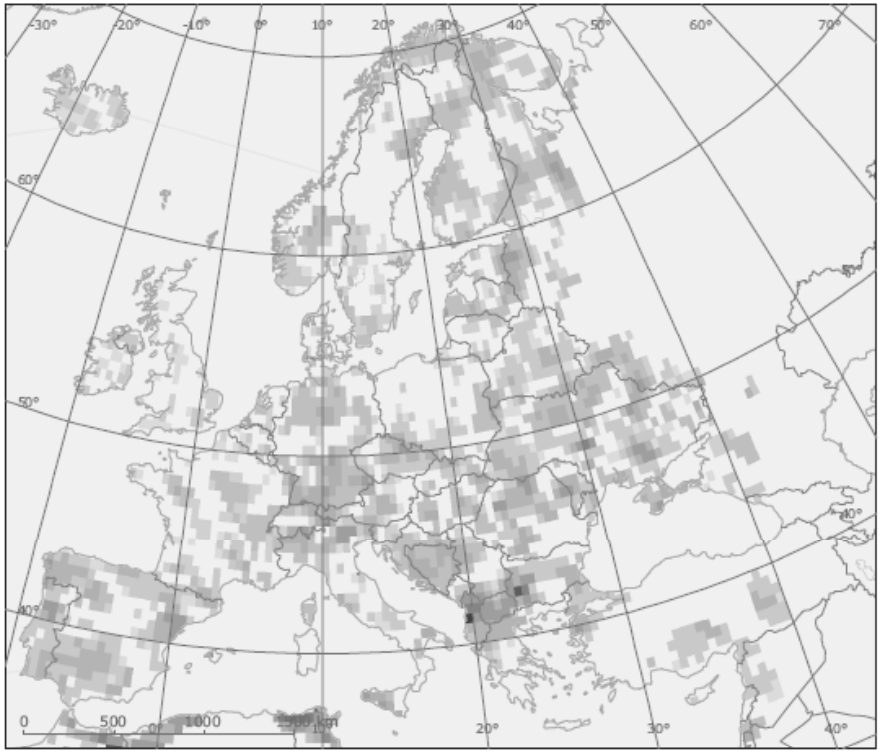
- Increase in frequency, intensity and duration of heat-waves
- Further decrease of number of cold days and frost extremes

future

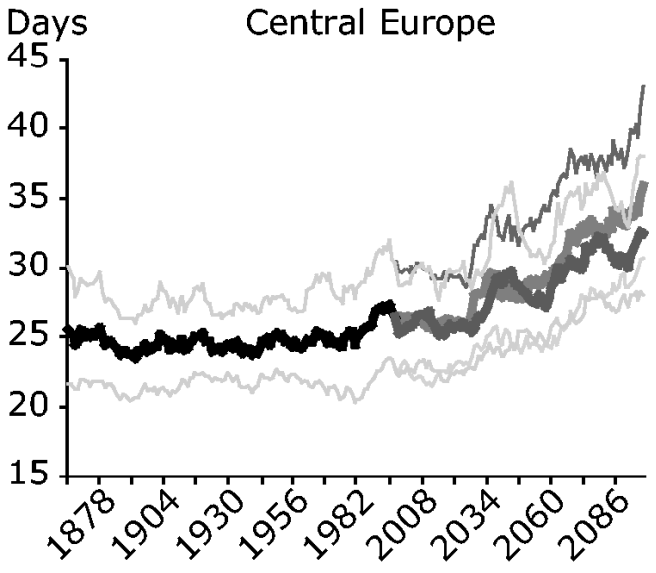
Precipitation extremes in Europe

- Intensity of precipitation extremes increased in the past 50 years (across Europe)
- No change in part of Europe experiencing meteorological drought conditions

past



Changes in the contribution of heavy rainfall to total precipitation between 1961-2006



Number of consecutive dry days (1860 – 2100)

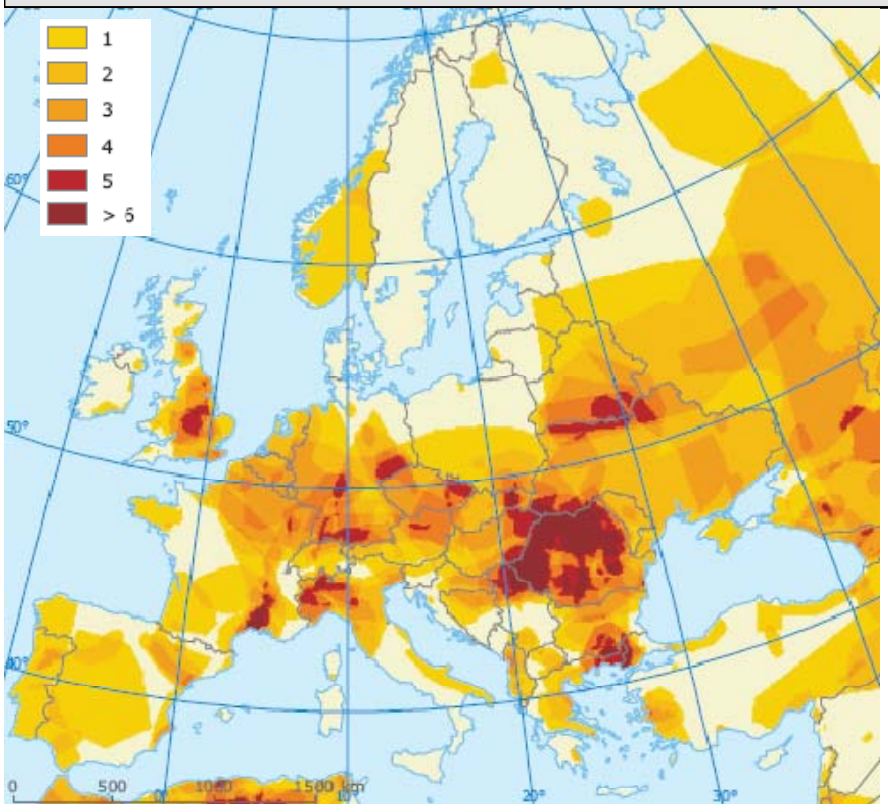
- More frequent heavy precipitation events (across Europe)
- More and longer dry periods (especially in southern Europe)

future

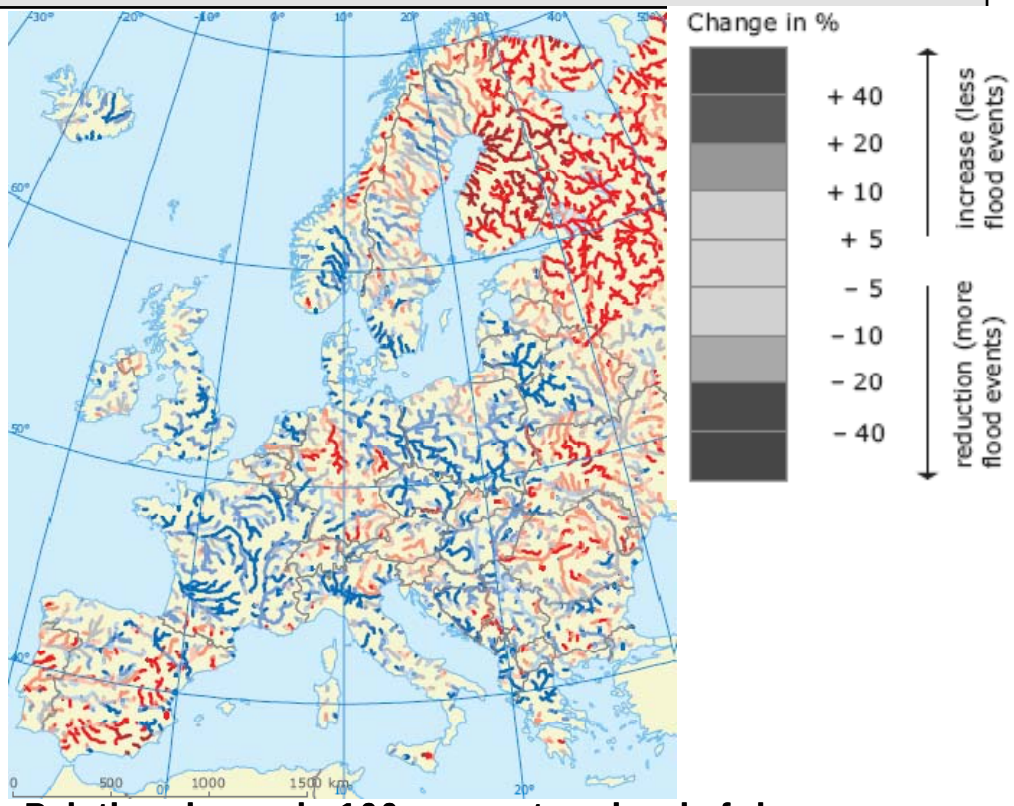
River floods

past

- Since 1990, 259 major river floods have been reported in Europe (165 since 2000), the increase is mainly because of better reporting and land-use changes



Occurrence of flood events 1998-2008



Relative change in 100-year return level of river discharge between 2071-2100 and 1961-1990

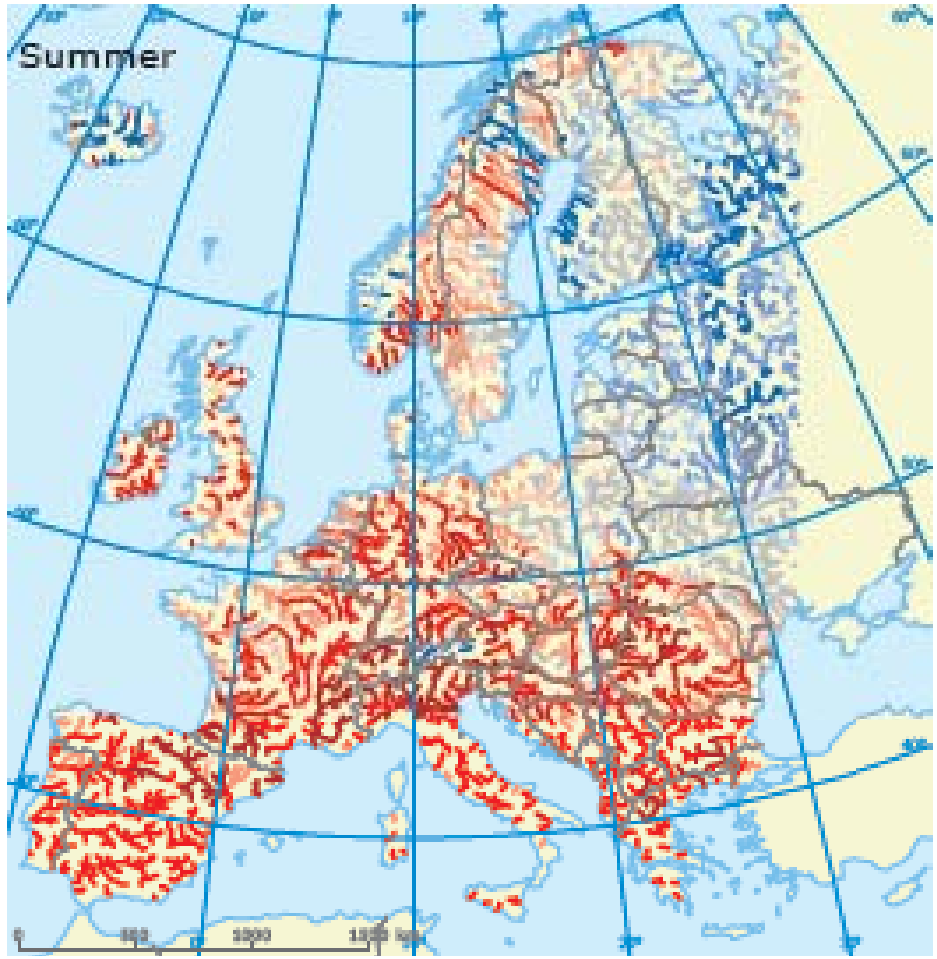
future

- Increase in the occurrence and frequency of flood events in large parts of Europe
- Less snow accumulation in winter and lower risk of early spring flooding

Drought

Relative change in mean summer minimum 7-day river flow between 2071-2100 and 1961-1990

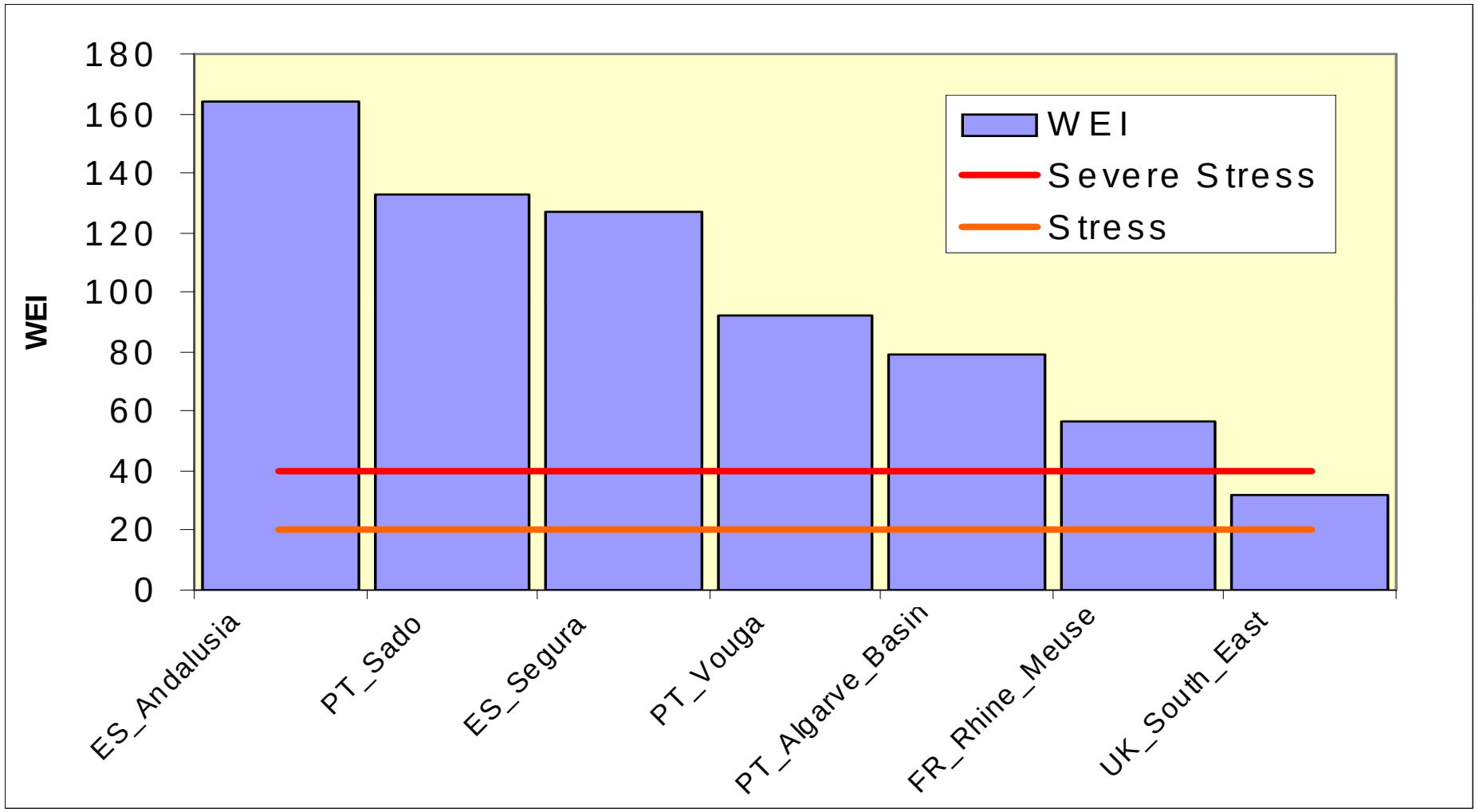
- Increase in frequency and intensity of droughts in many regions of Europe
- Southern and south-eastern Europe are most prone to an increase in drought hazard, but minimum river flows will also increase in many other regions



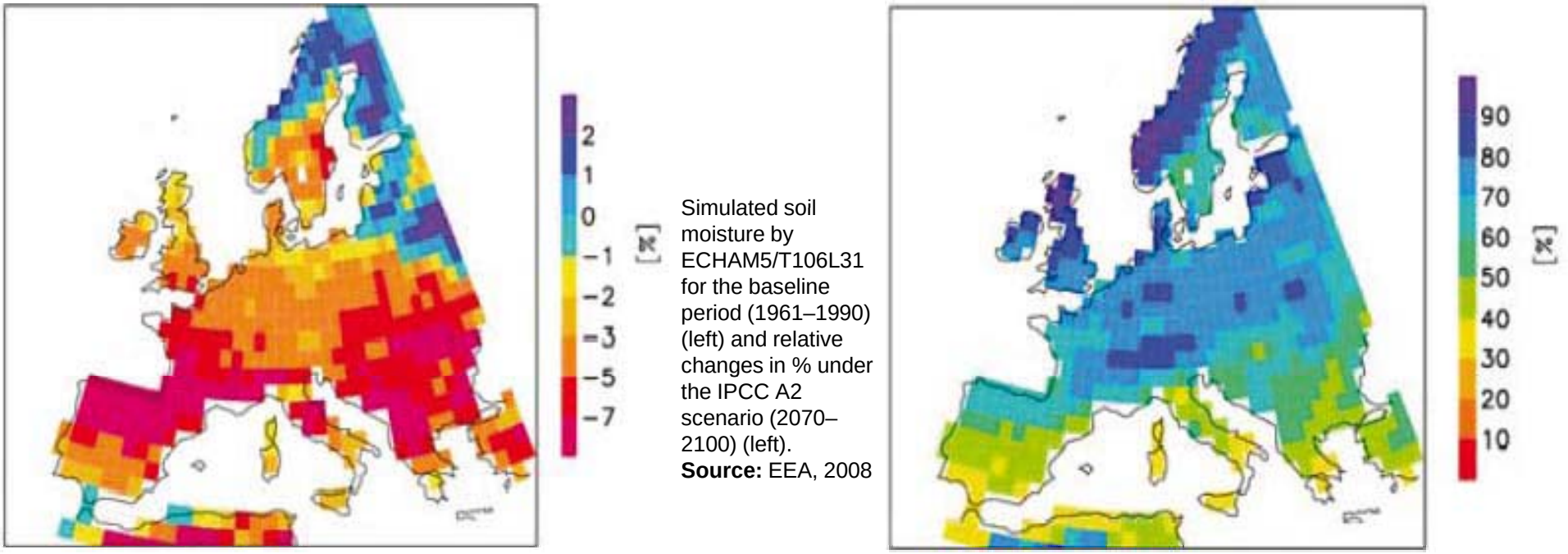
Water Stress has reached a critical level across much of Europe

- Caused by a combination of scarcity and drought
- Scarcity; Overexploitation of water resources
- Drought; has cost Europe EUR 100 billion over the last 30 years.

River basin scale WEI's indicate extreme stress

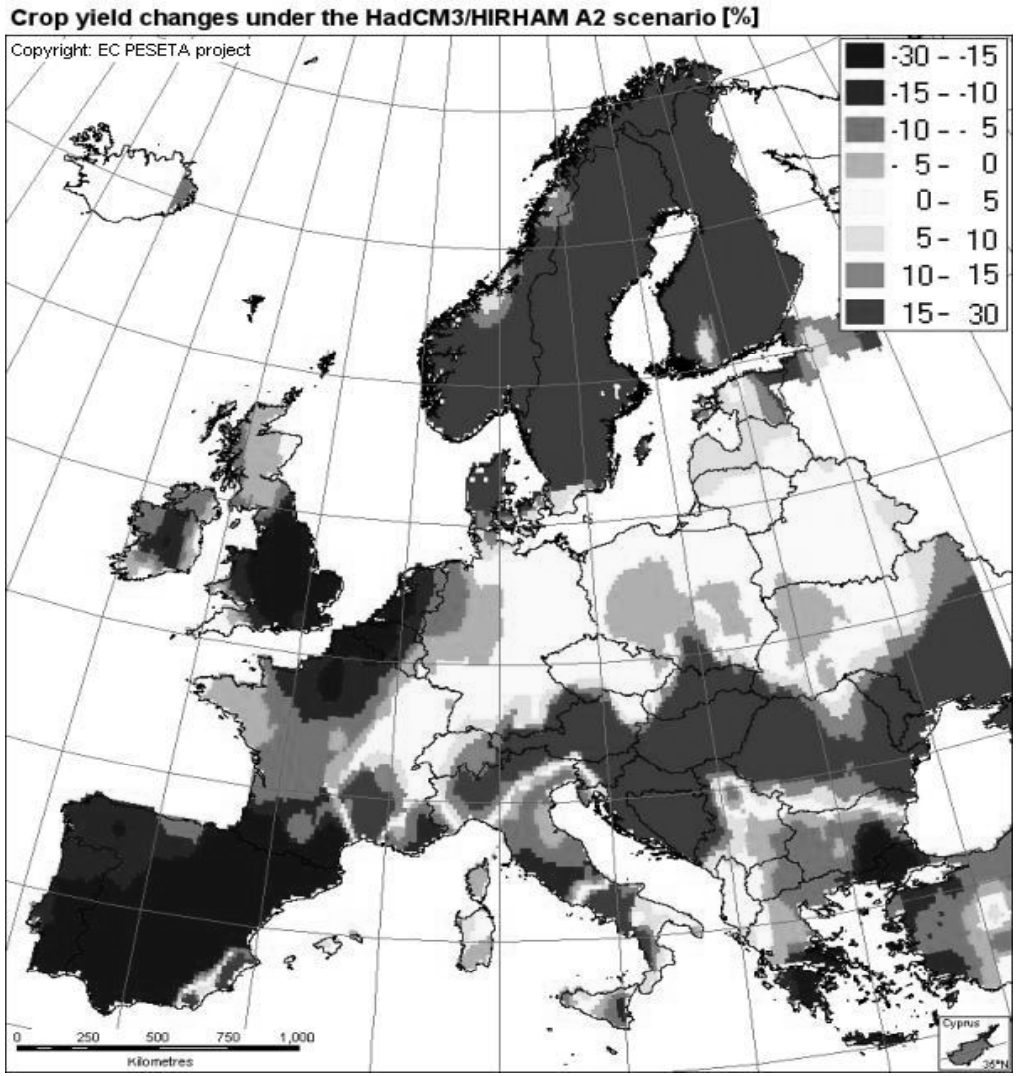


Land use and soil



Simulated soil moisture by ECHAM5/T106L31 for the baseline period (1961–1990) (left) and relative changes in % under the IPCC A2 scenario (2070–2100) (left).
Source: EEA, 2008

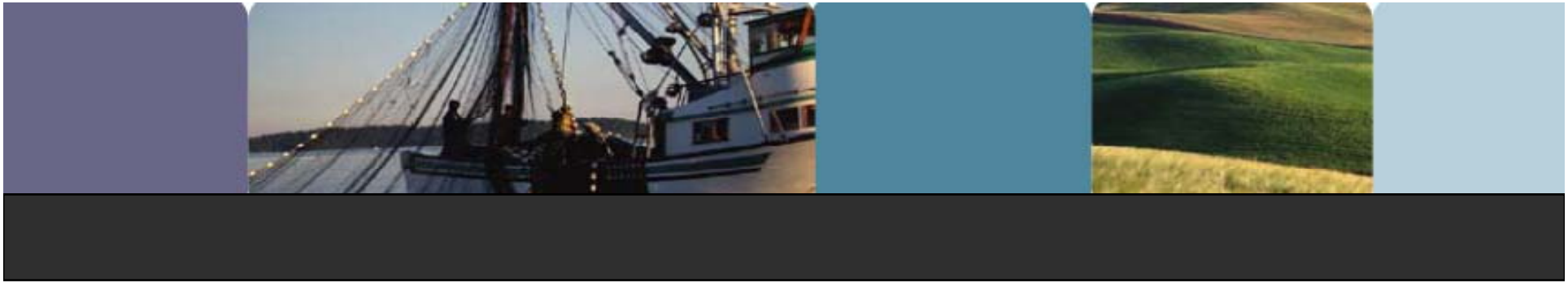
- Maintaining water retention capacity important to reducing the impacts of intense rainfall and droughts
- Desertification potentially extending to the Mediterranean regions of the EU due to exacerbation of its environmental drivers (erosion, salinisation and soil organic matter decline) and climate change.



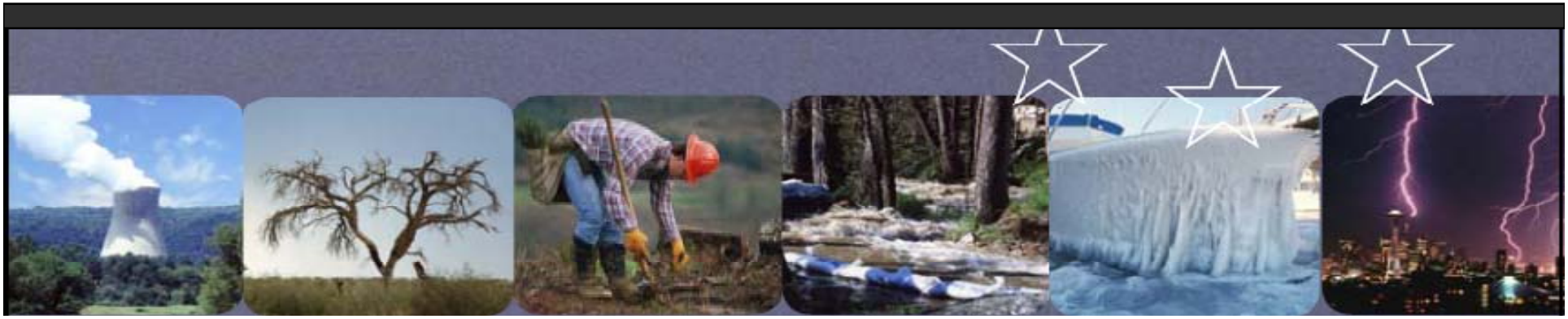
Crop yield changes in 2080

The map shows the change in yield from current to the period 2070-2100 (A2 scenario) based on PRUDENCE HadCM3/HIRHAM.

Source:
Text based on 'Adaptation to Climate Change in the Agricultural Sector'.AGRI 2006-G4-05. AEA Energy & Environment and Universidad de Politécnica de Madrid. Report to DG Agriculture and Rural Development, 2007. Map from PESETA Project, A. Iglesias/L. Garrote.

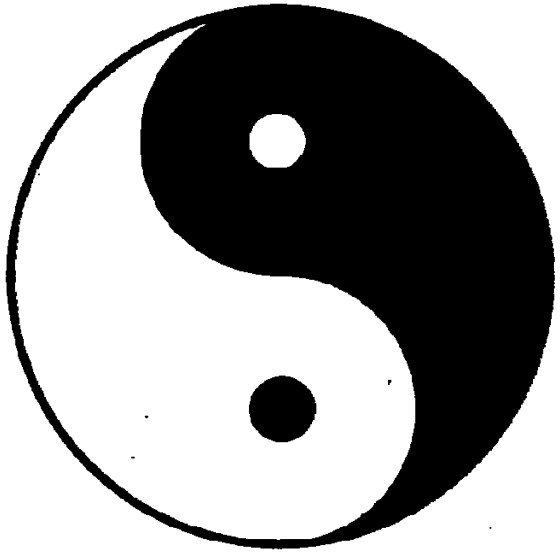


AN EU ADAPTATION FRAMEWORK



MITIGATION AND ADAPTATION COMPLEMENTARY EFFORTS

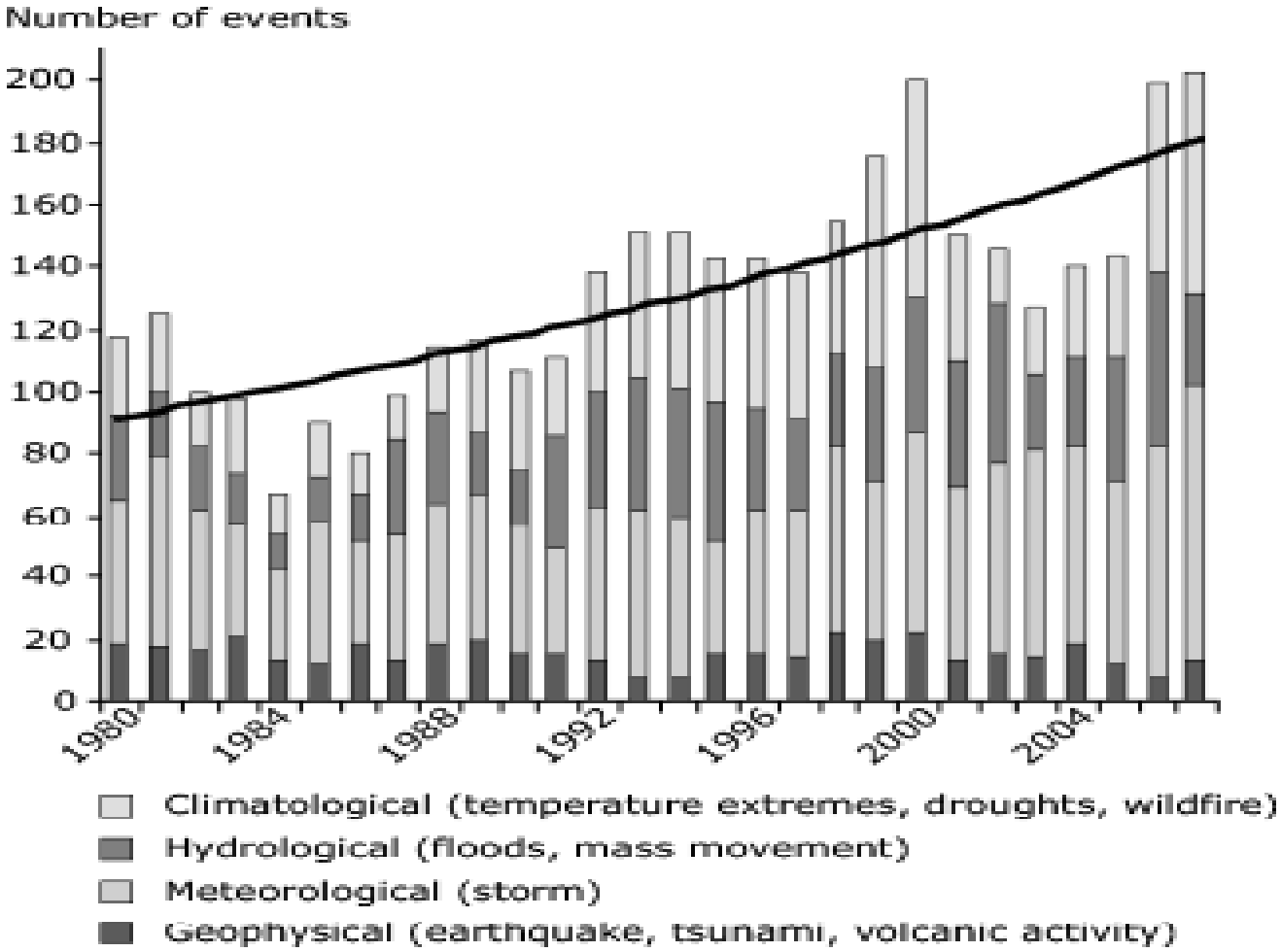
MITIGATION



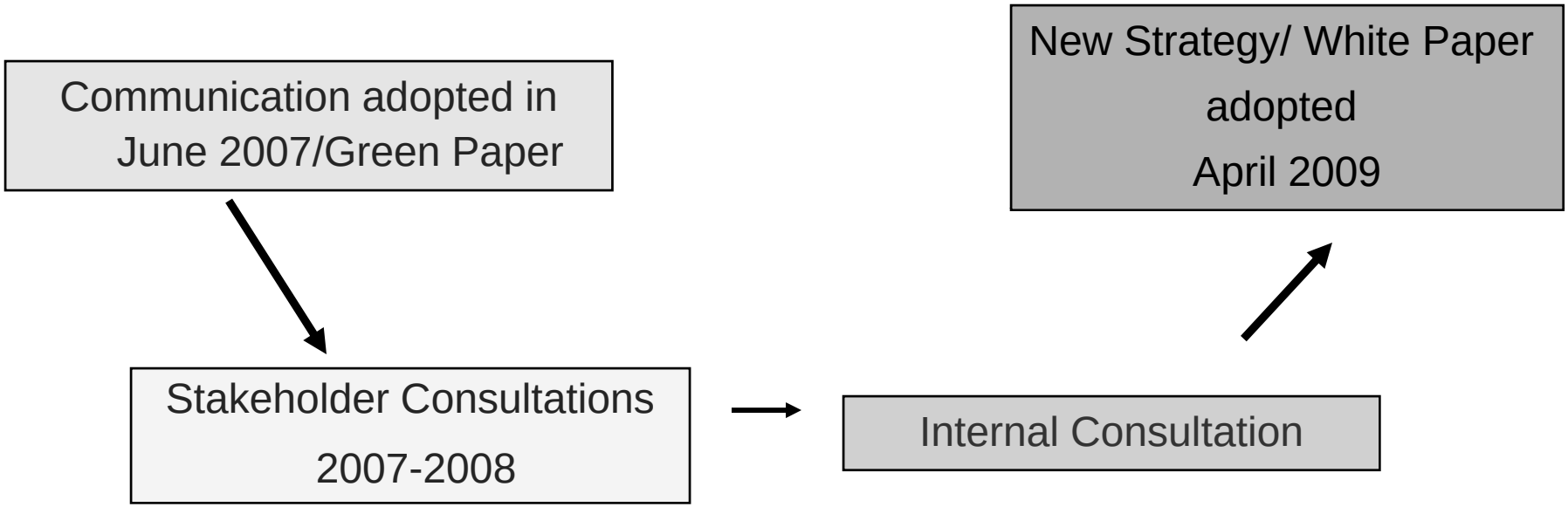
ADAPTATION

- **EU Goal: to maintain global warming at + 2°C (pre-industrial times)**
- **This Goal will limit the risks and magnitude of climate change but will not avoid all impacts**
- **Adaptation will be a necessary and complementary effort to mitigation**
- **The more Mitigation the less Adaptation will be required and vice versa**

NATURAL DISASTERS IN EUROPE, 1980-2007



POLICY MAKING PROCESS AT EU LEVEL



Development of an EU Adaptation Framework

Main Policy

WHITE PAPER on Adapting to climate change : Towards a European Framework for action

COM(2009)147 of 1.4.2009

European COMMISSION STAFF WORKING DOCUMENTS Accompanying the WHITE PAPER

- Adapting to Climate Change: the Challenge for European Agriculture and Rural Areas SEC(2009)417
- Human, Animal and Plant Health Impacts of Climate Change SEC(2009)416
- Climate Change and Water, Coasts and Marine Issues SEC(2009) 386

EU ADAPTATION FRAMEWORK

Objective:

To improve the EU's resilience to cope with the impacts of climate change

Phased approach:

- Phase 1: 2009-2012 – Lay ground work

- Phase 2: 2013 onwards - Implementation of a comprehensive adaptation strategy

EU ADAPTATION FRAMEWORK
-Phase 1: 2009-2012

- Strengthen the Knowledge/Evidence Base
- Mainstream climate Adaptation into key policy areas
- Employ a combination of policy instruments
- Financing issues
- Advance work internationally on Adaptation

Working in Partnership with EU, national , regional and local authorities

STRENGTHENING THE KNOWLEDGE BASE – AN ESSENTIAL STEP FORWARD

- Sound scientific results are paramount
- Current reporting/data mechanisms are fragmented
- EU Strategy will focus on strengthening the knowledge base
- Important starting point – European Clearing House Mechanism (CHM)

CLEARING HOUSE MECHANISM

- Europe wide data repository and platform for knowledge

- Clearing House Mechanism will be a one-stop shop, web-enabled system providing access to information sources, documents, data, case studies etc..

- Expected to be operational in 2011

- Scoping study underway -in parallel, methods, models, data sets and prediction tools will be developed

Benefits and users of an EU Clearinghouse on impacts, vulnerability and adaptation

- Contributes to the implementation of the Commission White Paper on Adaptation (and the Shared Environmental Information System)
- Provides networking for existing and future thematic and national/regional networks and organisations
- Goes beyond national borders (transboundary impacts)
- Access to results of research projects (EU RTD, national)
- Supports the coordination of EU contributions to the UNFCCC
- Users: European (EC, EP, EEA), National (various ministries), Trans-national (e.g. river basins), Sub-national (regional and local authorities), others (NGOs, businesses, citizens)

MAINSTREAM ADAPTATION INTO KEY POLICY AREAS

Step by step approach - based on solid scientific and economic analysis

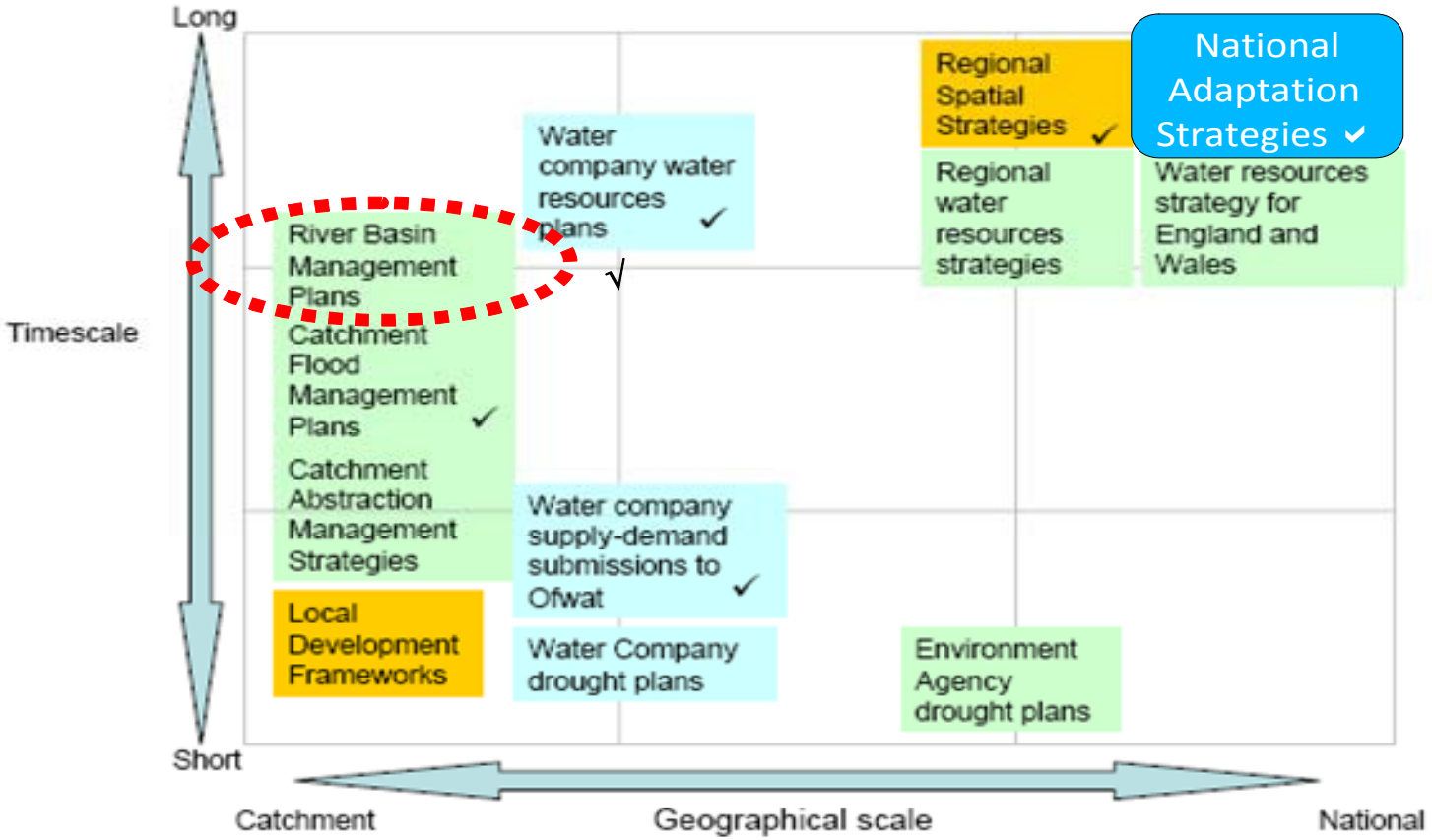
For now: "No Regrets" measures – funding: existing national or EU Rural Development or Regional Funds

Review and assess appropriate options by sector and implement in relevant EU policies (Agriculture, Health, Transport, Energy etc.)

Develop Adaptation Strategies outlining the action required

Draft EU Guidance: How to adapt to climate change with regard to water issues and EU water legislation

- Being prepared by countries and Commission (Water FWD) for river basin management plans (RBMP) due in 2015, only few 2009 RBMPs include adaptation



Wade et al., adapted by EEA

Employ a Combination of Policy Instruments

- European Economic Recovery Plan – contains a number of proposals modernising European infrastructure, promoting energy efficiency in buildings etc.)
- Insurance and other financial services products Market Based Instruments
- EU-ETS – using revenue generated from auctioning allowances for adaptation purposes

ADVANCE WORK INTERNATIONALLY ON ADAPTATION

The EU is committed to working with third countries to improve their resilience and capacity to adapt to the adverse effects of climate change through for example:

- Bilateral and Regional Agreements

- The Global Climate Change Alliance

- The UNFCCC - EU Proposal for a Comprehensive Framework for Action on Adaptation (FAA)

WORKING IN PARTNERSHIP

- Close co-ordination with EU Member States is essential in preparing effectively to address the impacts of Climate Change

- Establish Impact and Adaptation Steering Group (IASG) with Member States

- IASG will develop the 4 Pillars and take Adaptation Framework forward

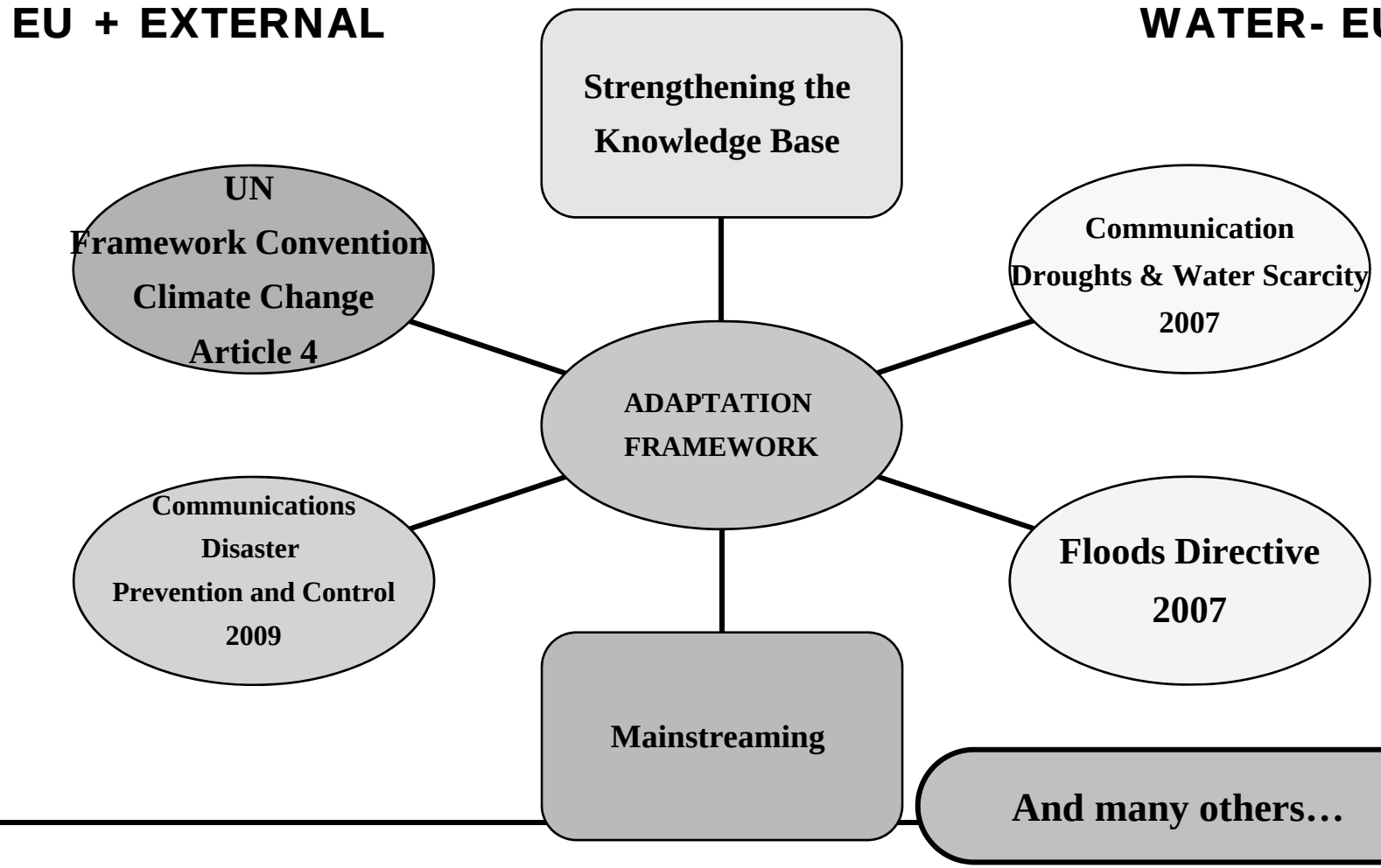
- Steering Group will be supported by technical groups and will consult with civil society and the scientific community

Last but not least…Data and information needs impacts and adaptation

- Improved monitoring and reporting:
  - National monitoring (GCOS essential climate variables)
  - Regular national or EU-wide monitoring at right scales (river basin etc)
- Improved and coordinated scenarios:
  - High resolution scenarios regional level
  - Consistency between climate and socio-economic scenarios
- Improved understanding of vulnerability
  - Models and methods
- Information on good practices in adaptation
  - Effective adaptation measures and costs
  - Avoid 'mal-adaptation'
- Indicators to monitor adaptation actions and effectiveness
- Better information exchange mechanisms

EU and national research and GMES could help fill many of these gaps, while the proposed EU Clearinghouse can provide the current information that can already now support adaptation actions

INITIATIVES LINKED TO ADAPTATION




Maak ruimte voor klimaat!
Working together with water
A living land builds for its future
Findings of the Delta commissie 2008
HM Government
Adapting to climate change in England
A FRAMEWORK FOR ACTION
defra
Ministry of Agriculture and Forestry
Finland's National Strategy for Adaptation to Climate Change
Publication 1a/2005
Observatoire national sur les effets du réchauffement climatique
Stratégie nationale d'adaptation au changement climatique
La documentation Française
Strategi for tilpasning til klimaændringer i Danmark
Regeringen
PLAN NACIONAL DE ADAPTACIÓN AL CAMBIO CLIMÁTICO
MARCO PARA LA COORDINACIÓN ENTRE ADMINISTRACIONES PÚBLICAS PARA LAS ACTIVIDADES DE EVALUACIÓN DE IMPACTOS, VULNERABILIDAD Y ADAPTACIÓN AL CAMBIO CLIMÁTICO
Die Bundesregierung
Deutsche Anpassungsstrategie an den Klimawandel
vom Bundeskabinett am 17. Dezember 2008 beschlossen
NEMZETI ÉGHAJLATVÁLTOZÁSI STRATÉGIA
2008-2025
FINLAND
ESTONIA
LATVIA
LITHUANIA
BELARUS
KAZAKHSTAN
UNITED KINGDOM
NETHERLANDS
GERMANY
POLAND
BELGIUM
LUXEMBOURG
CZECH REPUBLIC
SLOVAKIA
FRANCE
LIECHTENSTEIN
AUSTRIA
HUNGARY
SWITZERLAND
SPAIN
PORTUGAL
GEORGIA
ARMENIA
IRAQ
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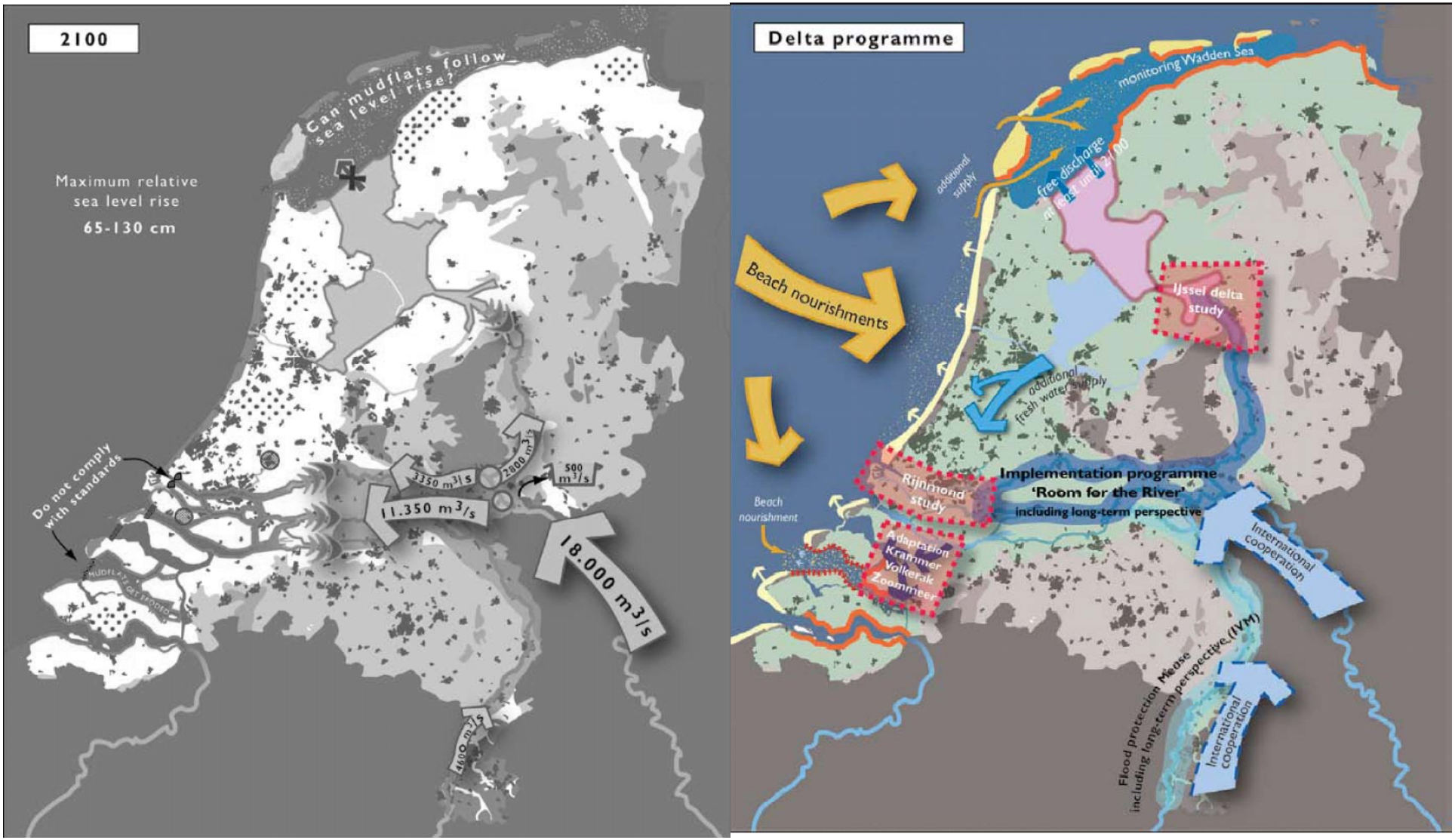
Status of development of national adaptation strategies

Adopted a NAS	Preparing a NAS	IVA assessments
Finland (2005)	Czech Republic	Austria
France (2006)	Norway	Greece
Spain (2006)	Romania	Iceland
Netherlands (2007)	Estonia	Ireland
Denmark (2008)	Latvia	Lithuania
United Kingdom (2008)	Portugal	Sweden
Germany (2008)		Switzerland
Hungary (2008)		

Source: EEA, 2008; PEER, 2009

Delta committee plan for Netherlands (2008)

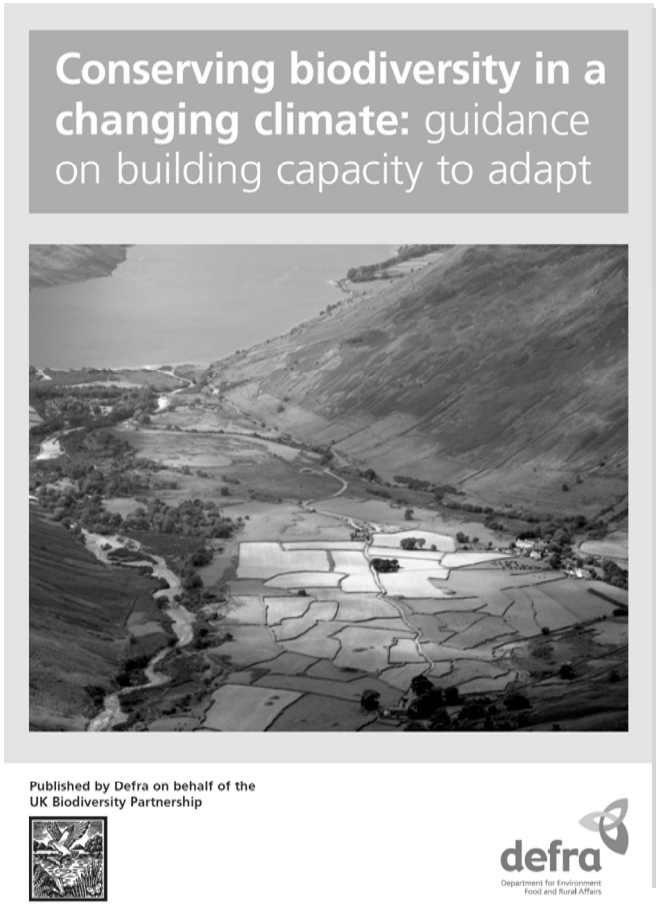


Recommendations for the future (Netherlands)

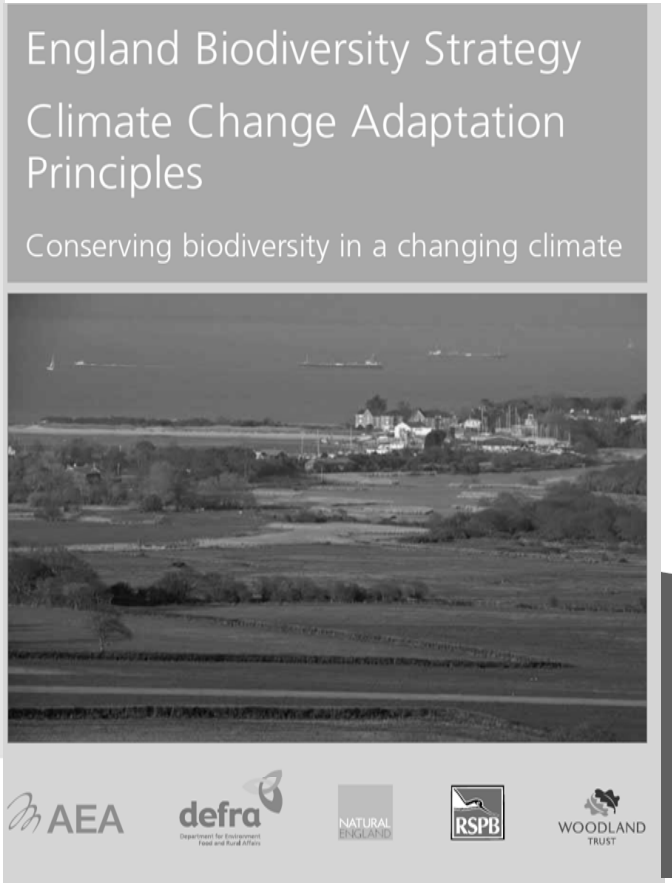
- **Flood protection level**: raised by factor 10 (assuming a regional sea level rise of up to 1.3 m by 2100)
- **New urban development**: cost-benefit analysis for flood-prone areas
- **Areas outside the dikes**: users are responsible for safety
- **North Sea coast**: continued beach nourishment
- **Wadden sea** area: monitor situation, depending on sea level rise
- **South-western delta**: additional sand nourishment and technical interventions storm surge barrier; enforcement of dikes; temporary storage of excess water from Rhine/Meuse
- **Major rivers** area: measures to accommodate 18.000 m3/2 (Rhine) and 4600 m3/s (Meuse)
- **Rijnmond** (mouth of Rhine): new closable open system
- **IJsselmeer** lake: raise level by 1.5 m gradually
- **Delta Act**, and Delta fund to be established

Total costs: 1.2 – 1.8 billion euro / year

UK approaches to biodiversity and climate change adaptation



Defra, 2007



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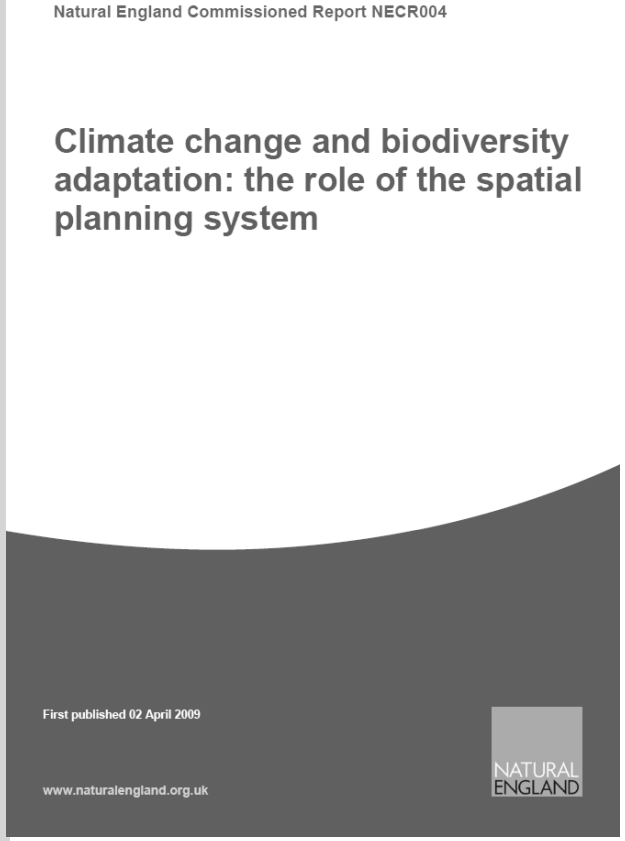
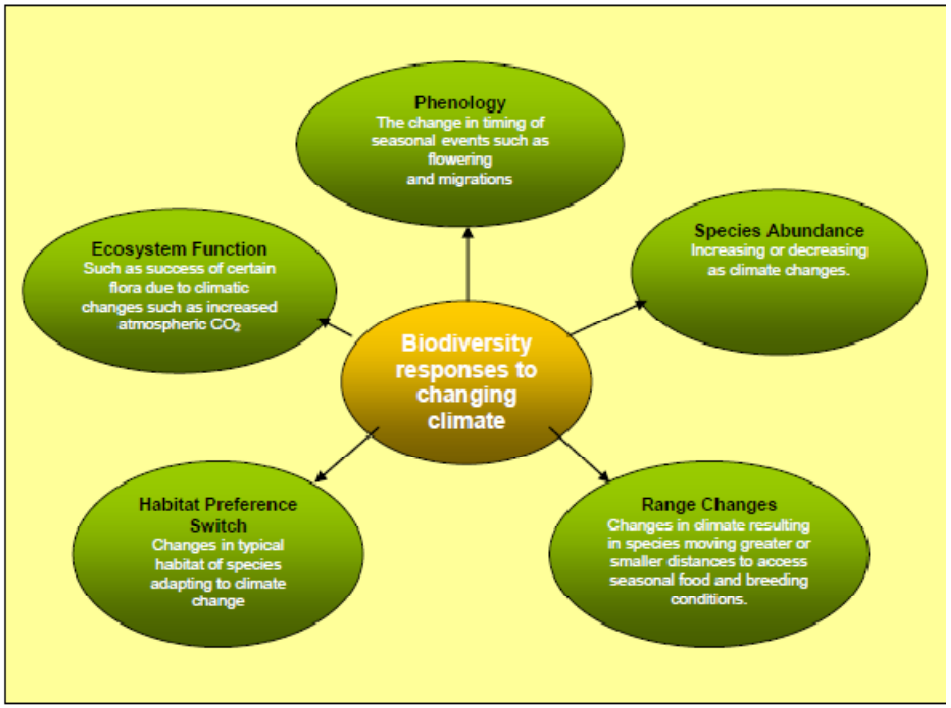


Natural England, 2009

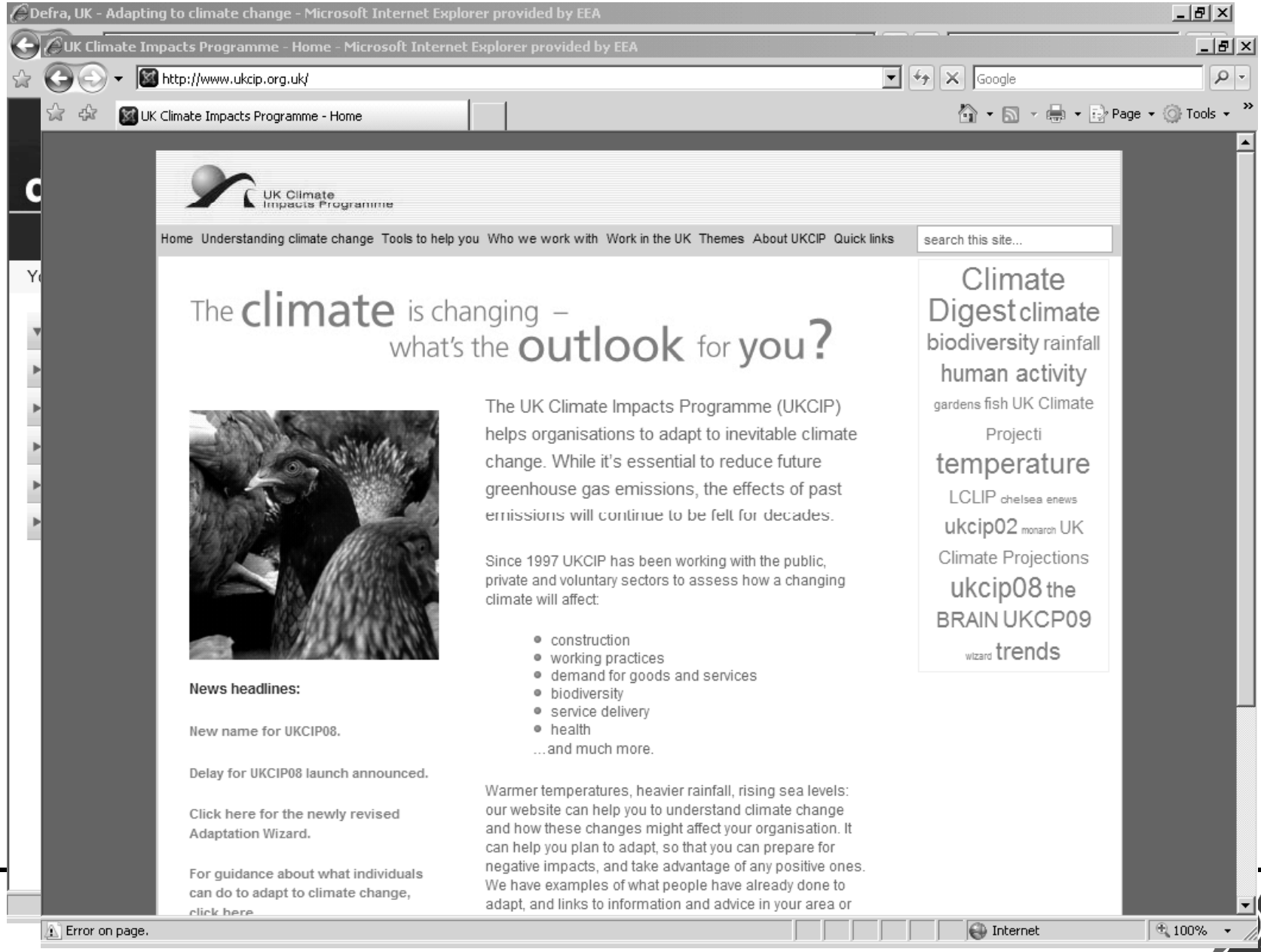
Responses by biodiversity/ecosystems to climate change and main adaptation principles (UK)



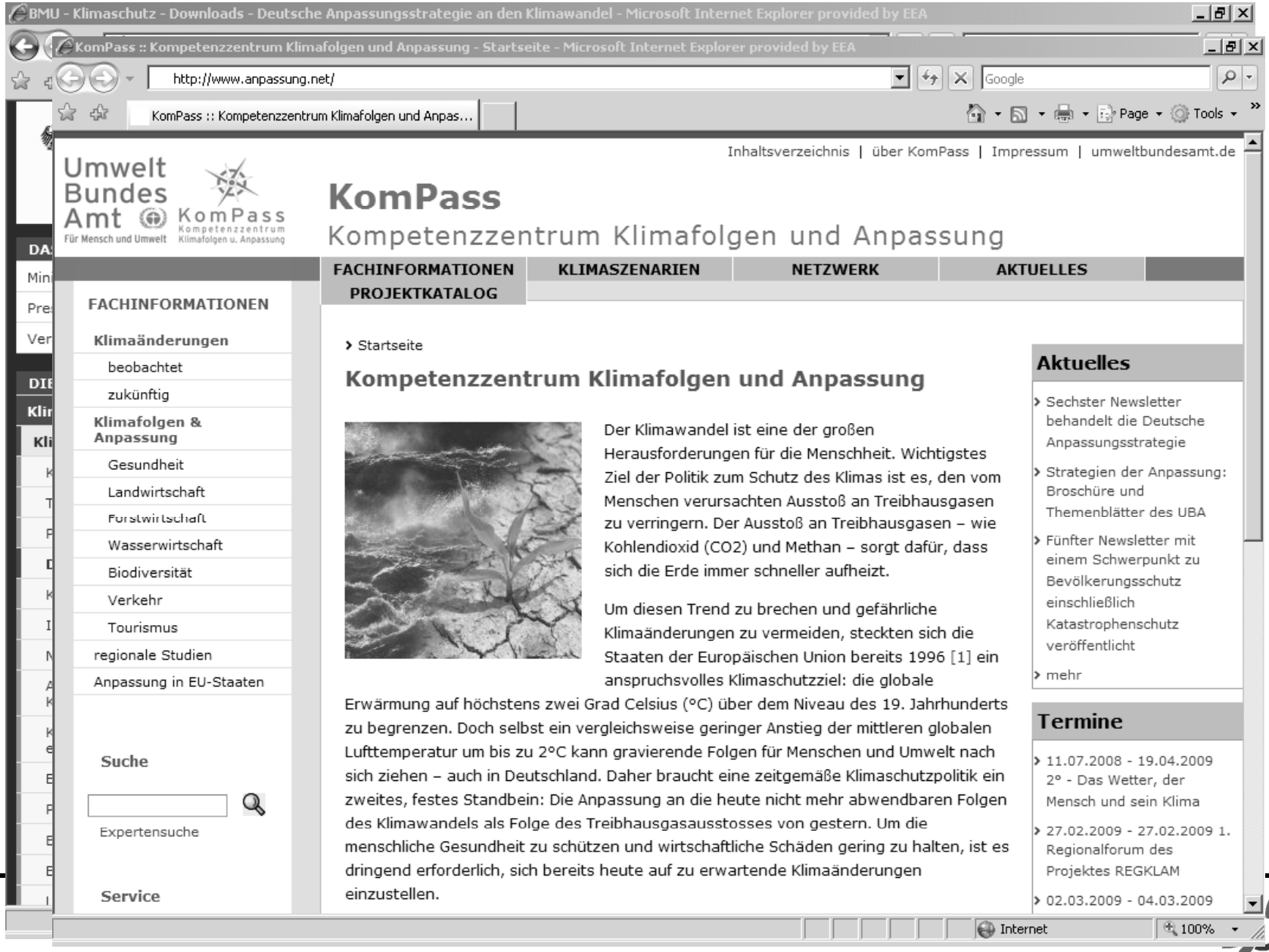
Natural England, 2009

Defra, 2008

Example of national plan/portal (UK)



Example of national plan/portal (DE)



Relevant EEA activities

- Strengthen the Knowledge/Evidence Base (by 2011)
  - Support development of the ***Clearing House***
  - Regular reporting on CC ***impact indicators*** (with WHO, JRC)
  - Assist in developing ***vulnerability and adaptation indicators***
- Mainstream climate adaptation into key policy areas:
  - Contribute to guidelines and a set of tools (guidance and exchange of best practices) by the end of 2009 to ensure that the ***River Basin Management Plans*** (RBMP) are climate-proofed
  - Help ensuring that climate change is taken into account in the implementation of the ***Floods Directive***.
  - Support the drafting of guidelines by 2010 on dealing with the impact of climate change on the management of ***Natura 2000 sites***
  - Help ensuring that adaptation in coastal and marine areas is taken into account in the framework of the Integrated Maritime Policy, in the implementation of the ***Marine Strategy Framework Directive*** and in the reform of the Common Fisheries Policy

Draft EEA report Vulnerability to climate change and adaptation to water scarcity in the European Alps

- Review to start soon; publication mid/autumn 2009
- Alps (Europe's "water towers") feed large water catchments (Danube, Rhine, Po, and Rhone)
- Case studies on water resource issues: Austria (Lavant valley, Vienna), Italy (South Tyrol), France (Savoy), Switzerland (Valais), Slovenia (river Soča)
- Legal requirements (EU WFD), economic incentives (e.g. water prices), availability of technological adaptation solutions (e.g. drop irrigation) and concrete water resource problems are important for adaptation
- Key however are also institutional and organisational factors (involvement of stakeholders, multi-level governance)
- A proactive, precautionary, long-term, integrative, participatory and adaptive water resource management approach is key for successful adaptation

Conclusions and recommendations

- **Adaptation to climate change has only recently started, some MS are advanced (with a national adaptation strategy)**
- **The White Paper provides a comprehensive EU-wide approach (phase 1, 2009-2012; phase 2 from 2013)**
- **Strengthening the Knowledge/Evidence Base and Mainstreaming adaptation into key policy areas are particularly important**
- **Adaptation will be key (especially for developing countries) in a future post-2012 agreement**
- **EEA is contributing and will continue doing so (e.g. proposed Clearinghouse, indicators, regular EU-wide assessments, guidance related to water and biodiversity)**
- **The proposed EU Clearinghouse can have many benefits for governments at various levels (in line with SEIS)**

- http://www.eea.europa.eu/themes/climate
- http://ec.europa.eu/environment/climat/climate_action.htm
- http://ec.europa.eu/environment/climat/adaptation/index_en.htm